**Eclipses in the classroom**

Building the Sun-Earth-Moon system described below will allow your class to discover how and why eclipses happen. They will be able to understand exactly what they are seeing if ever they see a real eclipse. Building the model, which is not to scale, takes about 45 minutes.

Image courtesy of Marissa Rosenberg

**Materials**

For each model, you will need:

* Adhesive tape
* Glue
* Two cardboard tubes (e.g. empty toilet rolls)
* Torch (Flashlight)
* Scissors (suitable for cutting cardboard)
* Aluminium foil
* Sturdy but bendable wire (35-50 cm long) (Coat Hangers)
* Styrofoam ball the size of a large orange
* Ping pong ball (or a Styrofoam ball of a similar size)
* Large strip of cardboard (about 60 cm in length and no less than 20 cm in width)
* Stack of books or magazines

**Method**

1. Divide the class into groups of three or four. Give each group their own materials to make the model.
2. Take one cardboard tube and make a series of small (2 cm) even, vertical cuts around the circumference of each end.
3. At each end, bend the cut pieces out, then stand the tube upright. At the top, the cut edges should fan out like a flower (see image).

 **Earth** **Step 3: making the base to support**

1. Using adhesive tape, fasten one end of the cardboard tube to the strip of cardboard; this is the base of the model. The tube should be at least 30 cm from one end of the cardboard strip.
2. Using tape or glue, attach the larger ball to the open flower of the tube. This ball is the Earth.

**Step 5: Placing Earth on its base**

1. Cover the smaller ball with aluminium foil, shiny side out. This is the Moon
2. Insert one end of the wire into the top of Earth, so that the wire is vertical.
3. Measure a finger’s length along the wire. Bend the wire at a right angle to give a horizontal arm.
4. Insert the other end of the wire into the Moon.
5. About halfway between Earth and the far end of the cardboard strip, measure a finger’s length along the wire and bend it downwards at a right angle, toward the cardboard base. The Moon’s equator should be at the same height as Earth’s equator.

[](http://www.scienceinschool.org/sites/default/files/articleContentImages/23/eclipses/issue23eclipses6_l.jpg)**Step 10: Bending the wire so that the equators of the Moon and Earth are at the same height.**

1. Balance the torch on a stack of books or magazines at the other end of the cardboard strip from Earth. Make sure the height is correct: the middle of the torch beam should hit Earth’s equator. If the beam is too diffuse, attach the second cardboard tube to the end of the torch to direct the light horizontally. Ensure the beam hits the nearest half of Earth and the Moon directly. If the beam is not bright enough, move the stack of books closer.

**Step 11: Adjusting the Moon and Sun so that the light from the Sun its Earth’s equator and the Moon can directly block the Sun’s rays from reaching Earth**

**Using the model**

[](http://www.scienceinschool.org/sites/default/files/articleContentImages/23/eclipses/issue23eclipses8_l.jpg)**Creating a solar eclipse.**Duration: 30-45 minutes.

1. Ask your students if they have ever seen an eclipse. [Was it a solar or a lunar eclipsew4](http://www.scienceinschool.org/2012/issue23/eclipses#w4)? (See Below) Explain that solar eclipses are much rarer but today they will be lucky enough to see both.
2. Create a solar eclipse. Stand facing the torch and swing the wire around until the Moon casts a shadow on Earth; if necessary, dim the lights. The Moon is now between Earth and the Sun and is blocking the sunshine for some people on Earth. Point out that only people directly in the shadow see a complete eclipse of the Sun. You can show how the shadow moves by slowly rotating the wire.
3. Now create a lunar eclipse. Stand facing the torch and swing the wire so that the Moon is behind Earth. No light should be hitting the Moon: Earth is between the Sun and the Moon, casting a shadow over the entire Moon. Explain that unlike during the solar eclipse, the entire ‘night side’ of Earth can see the lunar eclipse.

- See more at: <http://www.scienceinschool.org/2012/issue23/eclipses#sthash.7eOfXF5L.dpuf>

# w4Lunar Eclipse Compared To Solar Eclipse

A "lunar eclipse" and a "solar eclipse" refer to events involving three celestial bodies: the Sun ("solar"), the moon ("lunar"), and the Earth. A lunar eclipse occurs when the Earth passes between the Moon and the Sun, and the Earth's shadow obscures the moon or a portion of it. A solar eclipse occurs when the Moon passes between the Earth and the Sun, blocking all or a portion of the Sun.   
  
An eclipse can be total, partial, or annular. A total solar eclipse is when the moon blocks out the Sun entirely, a partial eclipse is when it blocks out a portion of the Sun, and an annular eclipse is when the moon is at its furthest point in orbit. It will not cover the Sun completely that's when you can see a thin ring of light emerging from the outside rim of the moon.   
  
**How are a lunar eclipse and solar eclipse different?**   
  
A lunar eclipse occurs at night and a solar eclipse occurs during the day. There are only certain times when either of them can occur. A lunar eclipse can only occur when the moon is directly opposite the Sun in the sky — a full moon. Even though there is a full moon each month, obviously a lunar eclipse does not occur on a monthly basis because the Sun isn't *exactly* in line with the Earth and the moon. The moon's orbit is actually tilted 5 degrees more than that of the Earth; otherwise, we would see a lunar eclipse each month.   
  
We can see lunar eclipses more readily than solar eclipses, and it has to do with proximity. The Moon is much closer to the Earth (well over 300 times closer than the Sun!), so the Earth has a much greater chance of blocking sunlight to the Moon, compared to the Moon blocking light from the Sun. Also, a lunar eclipse can be seen from a greater portion of the Earth. Solar eclipses, on the other hand, are more rare and when they do happen can only be seen by a very narrow segment of people on Earth, for a short period of time.   
  
It is quite safe to watch a lunar eclipse with the naked eye, while watching a solar eclipse without eyewear protection can seriously damage your eyesight. You can use a telescope to get a clearer view of the moon during an eclipse and really see what is happening.   
  
A solar eclipse has always had a more profound effect on humans than a lunar eclipse. This is probably because of the importance of the Sun to all life on Earth. In ancient China, a solar eclipse was thought to be the dragon coming to eat the Sun. The effect that an eclipse has on all life on Earth is of particular interest to scientists. They eagerly await a solar eclipse because it helps them to gather more knowledge about the Sun and its position with respect to Earth.

-http://www.moonconnection.com/lunar\_vs\_solar.phtml